STAT:5400 Midterm 1, 2018

<Your Name>

<date when you took exam>

1 LaTeX

"A system of measurement is a collection of units of measurement and rules relating them to each other... Systems of measurement in modern use include the metric system, the imperial system, and United States customary units." (Wikipedia contributors, 2018) Table 1 lists conversions between U.S. customary units and the metric system. Section 2 develops an R function to compute the conversions.

U.S.	Metric
1 inch	2.54 cm
1 inch	0.0254 m
1 foot	30.48 cm
1 foot	0.3048 m
1 yard	91.44 cm
1 yard	0.9144 m

Table 1: Converting U.S. customary length units to metric

2 R

1. Write an R function called `US2metric` to convert measurements from U.S. customary units to metric system units. Your function should accept three arguments:

   - the numeric value to be converted
   - the abbreviation for the original U.S. customary units (“in”, “ft”, or “yd”)
   - the abbreviation for the metric units into which the value is to be converted (“cm”, or “m”)

   Your function should check that all arguments have valid values, should do the conversion, and should return a list containing the numeric value after conversion and the abbreviation for the final units.

   Include the code for your R function.

```
> US2metric <- function( s, u1, u2)
+ {
+         if(!is.numeric(s) || !(u1 %in% c("in","ft","yd")) ||
+                              !(u2 %in% c("cm","m") ))
+                   {
+                           print("Invalid input.")
+                           val = NA
+                           units <- u2
+                 } else
+                 {
+                            units <- u2
+                           if( u1 == "in")
+                                   multiplier <- 2.54
+                           else
+                                   if(u1 == "ft")
+                                           multiplier = 30.48
+                                   else
+                                           if(u1 == "yd")
+                                                   multiplier = 91.44
+
+                           if(u2 == "m")
+                                   multiplier <- multiplier / 100
+
```

```
+                         val <- s * multiplier
+                 }
+
+                 list(val = val, units = units)
+
+ }
>
```

2. Show the code and output for running your function with the following sets of arguments:

   (a) `US2metric(5, "in", "cm")`

   (b) `US2metric("in", 5, "cm")`

   (c) `US2metric(5, "ft", "m")`

```
>         US2metric(5, "in", "cm")
$val
[1] 12.7

$units
[1] "cm"
>         US2metric("in", 5, "cm")
[1] "Invalid input."
$val
[1] NA

$units
[1] "cm"
>         US2metric( 5, "ft", "m")
$val
[1] 1.524

$units
[1] "m"
```

3. Read the dataset "Davis.txt" into an R object called `myDavis`. You may either download it from the web and read it from the file, or read it directly from the web. Include your line of R code here.

```
> myDavis <-
+ read.table("http://homepage.divms.uiowa.edu/~kcowles/Datasets/Davis.txt",
+           header = TRUE)
```

4. Use a built-in R function to display the structure of the `myDavis` object. The output should include the data type of each column. Include your line of R code and its output here.

```
> str(myDavis)

'data.frame':        200 obs. of  6 variables:
 $ subj: int  1 2 3 4 5 6 7 8 9 10 ...
 $ sex : Factor w/ 2 levels "F","M": 2 1 1 2 1 2 2 2 2 2 ...
 $ mwgt: int  77 58 53 68 59 76 76 69 71 65 ...
 $ mhgt: int  182 161 161 177 157 170 167 186 178 171 ...
 $ rwgt: Factor w/ 54 levels "?","100","101",..: 37 12 15 31 20 36 37 33 32 25 .
 $ rhgt: Factor w/ 33 levels "?","148","150",..: 27 9 8 23 7 14 14 27 23 18 ...
```

5. Briefly explain in words why the columns called `rwgt` and `rhgt` have a different data type from `mwgt` and `mhgt`. Insert your answer here.

   The `rwgt` and `rhgt` variables have some missing values, which are denoted with question marks in the data file. Therefore, R reads them as character variables rather than numeric and converts them to factors.

References

Wikipedia contributors (2018). System of measurement — Wikipedia, the free encyclopedia. `https://en.wikipedia.org/w/index.php?title=System_of_measurement&oldid=860113814`. [Online; accessed 28-September-2018].